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the well-known γ Andromedæ, distinctly, as two neatly separated stars, under a power of 828. It was discovered by the celebrated Struve, with the great Pulkova Refractor, and is a very severe test. He further wished to mention that, as La Place had anticipated, the ring of Saturn, which was quite visible, showed irregularities, which are most probably mountains, on its eastern side.

The President expressed the high sense which he entertained of the value of Dr. Robinson's researches on so important a subject as electric conduction; and observed that the Academy must feel deeply indebted to Dr. Robinson for the valuable and interesting information which he had afforded them on that point, and also with regard to the nature of the *nebulae*, as shewn by Lord Rosse's telescope.

The Rev. Dr. Robinson then read the following communication descriptive of the contents of an ancient bronze vessel found in the King's County, and now belonging to the collection of the Earl of Rosse. The antiquarian relics contained in this vessel comprised several celts, some spear-heads, gouges, and curiously constructed bells; they were composed of a beautiful hard bronze, in very fine preservation. The composition of the metal itself, and the style of workmanship evinced in the various articles, argued no mean degree of metallurgic skill in their fabrication. Several of those interesting relics were exhibited to the members; and drawings, which were pronounced to be admirable in their fidelity and minuteness, were displayed of the several implements of war and husbandry which were not exhibited.

“Several years ago, I remarked this vessel in the collection of the Earl of Rosse, and the singularity of its contents made me suppose a description of it might interest the Academy. I, however, found it impossible to acquire any information as to the locality or time of its discovery till now. It had been

purchased for Lord Rosse, about sixteen years since, by an inhabitant of Parsonstown; but the men who had found it, with that strange suspiciousness that is such a peculiar feature of the Irish peasant, had made him promise to keep the details secret during their lives. The last of them died this winter, and then Mr. — felt himself at liberty to give me this information. It was found in the townland marked Doorosheath in sheet 30 of the Ordnance map of King's County, near Whigsborough, the residence of Mr. Drought, in what appears from the description to have been a piece of cut-out bog, about eighteen inches below the surface. No river is near the spot; no bones or ornaments, or implements of any kind, were near it: though, had any gold or silver been discovered, the finders would probably not have acknowledged it to any one. I could not learn in what position it was found.

“A very good idea of the appearance of this vessel is given by fig. 1 of the accompanying drawing, for which I am indebted to Arthur E. Knox, Esq.* The scale is one-third of the original, and he has given very precisely the actual condition of its surface. It is composed of two pieces, neatly connected by rivets. The bronze of which the sheets are formed possesses considerable flexibility, but is harder than our ordinary brass; and it must have required high metallurgic skill to make them so thin and uniform. On the other hand, it is singular that, neither in this nor any other bronze implements with which I am acquainted, are there any traces of the art of soldering: if it might be supposed objectionable in vessels exposed to heat, yet in musical instruments this would not apply.

“Such vessels have often been found, but the contents of this are peculiar. When discovered (without any cover) it seemed full of marl, on removing which it was found to con-

* This vessel is very similar to one in the Museum of the Academy, which is marked D. 551. As several of the other objects described by Dr. Robinson resemble the specimens contained in the Museum, a reference to the latter is given in each case.

tain an assortment of the instruments which may be supposed most in request among the rude inhabitants of such a country as Ireland must have been at that early epoch. A few were given away, one of each, in particular, to the late Dean of St. Patrick's, and these are probably in our Museum; but the following remain :

“1. Three hunting horns, with lateral embouchure, shown on the scale of one-third at fig. 2 (D. 656).

“2. Ten others of a different kind, fig. 3 (D. 653) : these differ considerably in size, but that represented is of the average size. Some of the largest have the seam united by rivets; in others it is marked by a paler line in the bronze, which seems as if they had been brazed, but is probably owing to a thin web of metal, which penetrated between the halves of the mould in which they were cast. All of this kind seem to have had additional joints, of which three were found, figs. 4 and 5 (B. 963); at least, no other use of these pieces occurs to me; and in none of them is there any convenient embouchure.

“4. Thirty-one bells of various sizes, figs. 6 (B. 945) and 7 being the extremes; of the real size. They have loose clappers within, and many of them slits to let the sound escape more freely. The bronze in these is much harder than in the preceding, and has resisted decomposition almost entirely. I think it can scarcely be doubted that these were bells for cows and sheep, which would be specially useful among the dense forests which then overspread the island.

“5. Thirty-one celts, of very different sizes, but none sufficiently large to induce a belief that they were used in war. In many of them the colour of the bronze is such as, at first sight, to excite an opinion that they were gilded. There are

Two of the size of fig. 8 (B. 244).

Seven of the size of fig. 9 (B. 347).

Six of the size of fig. 10 (B. 350).

Five of a size intermediate between these, and

Six of the size of fig. 11 (B. 270).

Five of the size of fig. 12 (B. 276).

“It is worthy of notice that in all the points are entire and sharp, and the edges unbroken, and not seeming to have been ever used.

“6. Three gouges, fig. 13 (B. 181). These are, I believe, of comparatively rare occurrence, and therefore were, probably, of less extensive use than the celts; just as the common carpenter’s gouge is with respect to his chisel, to which I believe the others to have been the analogues. Their round edge is well adapted either for paring or for excavating bowls and goblets.

“But the finest specimens of workmanship are the spears, twenty-nine in number. These also are of various sizes, and of greater diversity of pattern than the other implements. There are

Two of the size of fig. 14 (B. 54).

Four of the size of fig. 15 (B. 38).

One of the size of fig. 16 (B. 35).

Seven of the same size, but a plainer pattern.

Nine of the size of fig. 17 (B. 34).

Six of a size two-thirds the preceding, but which it did not seem necessary to draw.*

* It is a curious circumstance that *six* kinds of spear-heads should have been found. Dr. R. had met with seven different names for this weapon in Irish; but as his knowledge of this language is very limited, he availed himself of the high authority of Mr. Eugene Curry, who gives them :

Uaighm,	pronounced	Loy-en.
Sleaigh,	. . . .	Shle.
Manáir,	. . . .	Mon-eesh.
Cruirpeach,	. . . .	Crusheach.
Foigha,	. . . .	Fow-gha.
Ɔae,	. . . .	Gaé.
Ɔabal,	. . . .	Ga-val.

With the remark, however, that Sleaigh and Ɔae are sometimes used indiscriminately. The Uaighmⁿ was of foreign introduction, and peculiar to the

“ These, also, have their points and edges perfect, and seem never to have been used ; they show not only that the workmen who made them were perfect masters of the art of casting, but also that they possessed high mechanical perceptions. If these weapons and the bronze swords (of which our Museum contains several) be compared with those used in our army, it will easily be seen that the former are constructed on principles far more scientific. Some of these may not be obvious to the ordinary reader, as they depend on the properties of bronze. This alloy, especially when in the proportion used for weapons (in which it is an atomic compound, containing fourteen equivalents of copper and one of tin, or nearly eighty-eight and twelve by weight, and possesses a maximum specific gravity considerably surpassing either of its elements), combines great strength and toughness, but has not hardness to take an effective and permanent edge. It has, however, been shown by D’Arcet, that if its edge be hammered till it begins to crack, and then ground, it acquires a hardness not inferior to the common kinds of steel, and is equally fitted for cutting instruments. Now, in fig. 14, the strong central cone of bronze, remaining in its ordinary state, effectually stiffens the weapon against fracture ; while the thin webs on each side have evidently been subjected to this or some similar process, for their edges are much harder, as well as brittle. In the smaller weapon, fig. 17, the web might be too thin, and,

men of Leinster ; it was, therefore, not likely to be used in this locality, so that the collection, probably, comprised all that were in demand. Among these names, four are evidently of Hebrew affinity. The second is identical with שֶׁלֶחַ (*shlech*), a missile spear ; the third comes from בִּנְיָהּ, fate ; the fourth, or rather its abbreviate form, חֲרֹחַ, is from חָרַת (*chreth*), to destroy ; the sixth is little altered from קֵץ (*kain*), a dart ; and the last, possibly, comes from גִּבּוֹר, to divide. Mr. Curry remarks, also, that several of these names are now given to agricultural instruments ; the loy and slaine are familiar examples : Mānair now means a mason’s trowel. It should seem that metallurgy was made the minister of war long before it became subservient to the arts of peace.

therefore, it is reinforced by a pair of secondary ribs; and in fig. 16, the most highly finished of them all, by four such. It is, however, possible that these ribs may have answered another purpose; they have so strong a resemblance to those on some Malay crises, that they may have been designed, as in those weapons, to retain poison. This practice, I fear, was not unknown among the ancient Irish, as, indeed, it seems to have prevailed among all the Celtic and Iberian races; thus, in the poem on the death of Oscar, published by Bishop Young, in the first volume of our Transactions, the spear of Cairbre is expressly said to be poisoned (*Níme*), and nothing seems to require a figurative sense of this epithet to be understood.

“The most obvious hypothesis respecting this curious assemblage of objects is, that they were the property of some individual, who concealed them in the bog, perhaps on the approach of a predatory party, and perished without recovering them. Against this is the fact that the tools and spears seem not to have been ever used, and the probability that, in such times, every spear-head would have been mounted, and in the hand of a combatant. It seems more likely that the collection was the stock of a travelling merchant, who, like the pedlars of modern times, went from house to house, provided with the commodities most in request; and it is easily imagined that, if entangled in a bog with so heavy a load, a man must relinquish it. And this is connected with another question, the source from which the ancient world was supplied with the prodigious quantities of bronze arms and utensils which we know to have existed. This caught my imagination many years since, and I then analysed a great variety of bronzes, with such uniform results, that I supposed this identity of composition was evidence of their all coming from the same manufacturers. Afterwards I found that the peculiar properties of the atomic compound already referred to are sufficiently distinct to make any metallurgist, who was en-

gaged in such a manufacture, select it.* It also appeared to me more permanent in the crucible than when of higher or lower standard. But the same conclusion is forced on us from another ground. Bronze contains tin; now this metal, for all commercial purposes, may be said to be confined to the south-west of England,† and, therefore, the bronze trade must have originated with persons who were in communication with Britain. But in ancient history we find only one people of whom this can reasonably be supposed, the Phœnicians, who, like ourselves, seem to have been the great manufacturers and merchants in olden time. That they had factories, if not colonies, in Spain, at a very early period, is known to all; and it seems most unlikely that such enterprising navigators would stop there. Of course, one can attach little weight to the remote traditions of Irish history, if unsupported by other probabilities; but the traces of Phœnician intercourse which they exhibit are borne out by the admixture of Punic words in the language, and by usages which show that the worship of the god Baal, and other Sidonian rites, had once prevailed in the island. Their traffic in amber proves that they must have gone yet further, even to the Baltic; for then, we may be sure, the land carriage of precious materials through various and hostile regions was almost impossible. All, too, that we know of early antiquity shows that they had the bronze trade in their hands. Even down to the time of Aristotle, tin was described by the epithet ‘Tyrian;’ and in every nation where bronze was in common use, their presence can be traced or inferred. In Egypt, where this compound was of universal use, we know that the

* The technical importance of atomic proportions is remarkable. Speculum metal is $4\text{Cu} + 1\text{St}$; gong metal is $8\text{Cu} + 1\text{St}$; that referred to is $14\text{Cu} + 1\text{St}$; the hardest metal used for cannon is $16\text{Cu} + 1\text{St}$.

† There are tin mines in Malacca, but we have no evidence that they were worked so early; and if they had been, it is quite improbable that their produce found its way to the Mediterranean.

people were little addicted to maritime pursuits ; while they were in close communication with the Sidonians (of the same race), through the Mitzräite colony of the Philistines. In Etruria, not less remarkable for its profuse employment of bronze, we know that they did not obtain it directly, for it is recorded that an expedition was fitted out by them, to open a communication with the tin islands, which failed, in consequence of the jealousy of the Phœnicians. Hence we may conclude that the latter held a monopoly of the tin. In Judea, we find Solomon obliged to employ a Tyrian founder for the bronze works of the temple, and we gather from the account, also, how they were cast—in loam.* But Greece, in the Homeric age, presents a state of things much more conformable to what I suppose was the condition of Ireland when this collection was buried. Iron scarcely appears to be in use ; and it may be surmised that the art of working bronze itself was not generally understood, from the poet's description of Vulcan making the arms of Achilles. No mention is made of casting or moulds, though a reference to Milton's splendid description of the infernal palace shews how much more poetic that would have been than the hammer and anvil. It seems as if the god merely heated and chased into shape sheets of metal, already prepared.† It may be added, that Homer describes all articles of superior workmanship as Sidonian ; and represents this people as trading in every part of Greece. Their ships run into some cove, and their factors go to the dwellings of the neighbouring chiefs. These, though at feud among themselves, and driving each other's

* Moulds for celts have been found here and in other countries, but were, perhaps, employed to recast old bronze ; they could not turn out work very neat, and many of these tools have apparently been cast in sand. These spears were, I think, cast in loam.

† Bronze is brittle at a red heat ; but it and even bell-metal are malleable at a temperature below visible ignition. Speculum metal is not brittle while red hot.

cattle on every opportunity, receive the strangers kindly, and purchase from them hardware, jewellery, articles of dress, and toys, in return for cattle and slaves." Now, just such a person I suppose the possessor of this vessel to have been, and of this very nation. Commerce was probably carried on in this way along the shores of the Mediterranean, till the destruction of Tyre by Nebuchadnezzar destroyed it also for a time, and then removed its most powerful centre of action to Carthage. That state seems to have chiefly directed its attention westward; and it is a confirmation of my opinion that the bronze trade was almost exclusively Phœnician, that about this time the use of the alloy rapidly gave way to iron and steel. In fact, the supply being cut off from Greece and Asia by the ruin of the Tyrians, *they* were obliged to seek other resources; but in Ireland and other Atlantic lands the traffic must have continued, nay, perhaps, even increased, in consequence of that event, till the fall of Carthage finally cut it off. I would also throw out another suggestion, though at considerable risk of being thought a dreamer. We see in Homer that the Phœnician traders were quite ready to have recourse to violence when they could profit by it; and, from more historic sources, that, in Lybia and Spain, they took an early opportunity of turning their factories into forts, and enslaving the natives. Did the same thing happen *here*, when the Tuatha De Danaan, a tribe rich in metallic ornaments and weapons, subdued the ruder Firbolgs, who referred their superior knowledge to magic? Were these shadowy personages also Phœnicians? Their name signifies "the tribe of the gods of the Dani or Damni." If the first, it might indicate Odin and his Asæ; but, besides that *they* must have been far later, it seems highly improbable that such fierce warriors would have been overpowered by any Celtic immigration. If the second, the Damni, the inhabitants of Devonshire and Cornwall, must have been completely under the influence of the Phœnician agents, and may at first have ima-

gined and called their accomplished visitors deities. In these Ogygian regions we must not reckon dates too closely ; but I believe it is held that the battle of Moytura, which established their dominion, was fought about 600 years before our Lord, and, therefore, at the very time when the fall of Tyre may have been supposed to scatter its people, and the ruin of their commerce incline them to desperate adventure. It is possible that this conjecture may be established or disproved by a comparison of the skulls found in the sepulchral monuments on their battle-fields with those of Tyrian or Carthaginian origin, if any such are known to exist."

Dr. Petrie made some remarks on the different characters of the bronze found in different counties in Ireland, and on the manner in which bronze articles were anciently cast.

The Rev. W. Roberts presented a memoir, by the Rev. Brice Bronwin, "On the Theory of the Planetary Disturbances."

In this memoir the disturbances are applied, as in M. Hansen's theory, and, as in it, are obtained by means of two times ; but the author has pursued a totally different route from him in finding them. The fundamental equations are investigated in a way that leads to many very beautiful formulæ, some of which appear to merit further consideration, as enabling us to change the form of the disturbance function, and to effect many transformations of a similar character.

The memoir also contains a new fundamental equation, not noticed by M. Hansen, and which leads very conveniently to the determination of the arbitrary functions of τ , the constant time, in the integrals ; moreover, these functions are presented under a much simpler form than that given by M. Hansen.

To determine the disturbances of the radius vector and longitude, with both the times, would be a work of immense labour. M. Hansen, therefore, in his lunar theory, has con-